THE CHANGES IN LEVEL OF *B*-ENDORPHIN, INTERLEUKIN-2, INTERLEUKIN-4, INTERLEUKIN-6, IMUNOGLOBULIN AND CORTISOL HORMONE ON PRACTICES OF BRETHING EXERCISE

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ABSTRACT

Background: *the study was to reveal the changes of immunity at breathing exercises. This was an experimental study. With randomized pre-posttest control group design.* ***Methods:*** *The population were students of MA Mu'alimin, in Yogyakarta. Respondents were 15 students for each groups. The unit analysis were data analysis from blood taken from vena cubiti. The dependent variables were levels of IL 6, IL 4, IL 2, cortisol, Beta Endorphin, and IgG. The training programme was conducted in 7 weeks, 3 times per week, sub maximal intensity, and 6 sets per session. The laboratory variable were the ELISA method.* ***Results:*** *Manova test were p: 0,000 implied that there were differences (Wilk Lambda p<0.05). At the matrix discriminant structure, it can be explained that the correlation between independent variables and the discriminant function formed with beta endorphin (0.501) had the strongest relation to the discriminant function, followed by interleukin 6 (0.367) while the other variables had less significant relation. Discriminator variables representing the function contributed to every discriminator of modulation immunity were beta endorphin, interleukin 6 and interleukin 4. Hence, beta endorphin had the strongest contribution to the increase of body immunity compared with other variables.* ***Conclusion:*** *Breathing exercises could increase physical fitness and impenetrability of proven body manifestly. Breathing exercise increased beta endorphin, immunoglobulin G and interleukin 6, while interleukin 2 and interleukin 4 did not increase. Cortisol level did not decrease significantly but there was an indication of level of cortisol decrease. Immunity modulator which caused breathing exercise stressor got by 3 groups with strong contribution on the basis concept of psychoneuroimmunologic.*

Key words: *breathing exercise, immunity, modulation*

ABSTRAK

Penelitian ini bertujuan untuk mengungkapkan perubahan kekebalan pada latihan pernapasan dan merupakan penelitian eksperimental, secara acak pra-posttest kontrol. Metode: Populasi penelitian adalah siswa MA Mu'alimin, di Yogyakarta. Responden 15 siswa untuk setiap kelompok. Unit analisis adalah data analisis dari darah yang diambil dari cubiti vena. Variabel dependen adalah tingkat IL 6, IL 4, IL 2, cortisol, Beta endorfin, dan IgG. Program pelatihan dilakukan dalam waktu 7 minggu, 3 kali per minggu, intensitas sub maksimal, dan 6 set per sesi. Variabel laboratorium adalah metode ELISA. Hasil uji Manova adalah p: 0,000 tersirat bahwa ada perbedaan antara kelompok (Wilk Lambda p<0,05). Pada struktur matrik diskriminan dapat dijelaskan bahwa korelasi antara variabel bebas dan fungsi diskriminan yang terbentuk dengan beta endorphin (0501) memiliki hubungan kuat dengan fungsi diskriminan, diikuti oleh interleukin 6 (0367) sedangkan variabel yang lain memiliki kurang signifikan hubungan. Diskriminator variabel yang mewakili fungsi memberikan kontribusi untuk setiap diskriminator imunitas modulasi adalah beta endorphin, interleukin 6 dan interleukin 4. Oleh karena itu, beta endorphin memiliki kontribusi yang paling kuat terhadap peningkatan kekebalan tubuh dibandingkan dengan variabel lainnya. Kesimpulan: Latihan pernapasan dapat meningkatkan kebugaran fisik dan kekebalan tubuh terbukti secara nyata. latihan pernapasan meningkat beta endorphin, imunoglobulin G dan interleukin 6, sedangkan interleukin 2 dan interleukin 4 tidak meningkat. Tingkat kortisol tidak menurun secara signifikan tapi ada indikasi tingkat penurunan kortisol. Imunitas modulator yang menyebabkan stressor latihan pernapasan didapatkan 3 kelompok dengan kontribusi yang kuat pada konsep dasar psychoneuroimmunologic.

Kata kunci: *latihan pernapasan, kekebalan, imunitas modulator*

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INTRODUCTION

Tai Chi is broadly used for therapy in many hospitals and rehabilitation centres. Though there are many schools for self-defense and breathing arts in Indonesia, yet the use of breathing exercises for therapy-fitness and health maintainance is not maximum. Breathing exercises are able to maintain physical fitness and enhance immunity (Suparto, 2001). Breathing exercises were developed with aim to prevent stressor and promote human conditions. These efforts are for managing stressor and even changes to homeostatis condition (Maryanto, 1990). As many advantages mentioned above, the development of human immunity through breathing exercises is yet not clear.

The breathing exercises are sports which include 1) step exercises 2) breathing exercises (inspiration and expiration such as certain rhythms), 3) concentration (spiritual: dhikr). Qvist (1993) stated that holding breath less than 30 seconds of blood gase is normal and holding breath in 32–95 seconds average produce PO_2 artery 62±14s. Past research showed, the period of holding breath in each step was 37–52 seconds. Thus, the exercise in holding breath is categorized as light hypoxia.

The concept of psychoneuroimunology can explain the biology phenomena, according to physiology and also patobilogy in relation to behaviors and immunity from neurotransmitter, neurohormonal, hormone, and lytokines.

General, objective of the research is to reveal the mechanism of body immunity enhance to breathing exercises, especially to determine in relation increase of Interleukin-6 (IL-6), Interleukin-4 (IL-4), Interleukin-2 (IL-2), Immunoglobulin G (IgG) beta endorphin and decrease of cortisol level.

METHOD

This was an experimental study aimed at revealing the influence of breathing exercises towards the enhancement of immunity. The study involved measuring levels of interleukin 6 (IL-6), interleukin 4 (IL-4), interleukin 2 (IL-2), beta endorphin, immunoglobulin (IgG) and cortisol, after breathing exercises. The design at the study was *randomized pre-posttest control group design*. It used physio-biology paradigm and the concept was to observe effect of physical exercises according to psychoneuroimunologic. The populations involved samples were students of MA Mu'alimin in Yogyakarta. The respondents were selected from population that fulfilled inclusion criteria. The calculation of sample size used the formula from Higgins and Kleinbaum (1985). The number of samples calculated for each group were 15 students. The unit analysis in the study was invoratory result from blood taken from vena cubiti. The blood was checked twice, before (pre-test) and after intervension (posttest is done 1 day after the treatment). Variables for analysis were interleukin 6 (IL-6), interleukin 4 (IL-4), interleukin 2 (IL-2), beta endorphin, immunoglobulin (IgG) and ortisol levels.

The breathing exercise program was completed in 7 weeks started by introduction and followed by training program for three times a week, composed of sub-maximal 6 set per session, with 15 steps. This program was conducted by intervension group in the afternoon. The examination of IL-6, IL-4, IL-2, cortisol, beta endorphin, and IgG levels was using the indirect sandwich ELISA (Enzyme Linked Immunosorbent Assay) method. Data were analyzed descriptively and by inferential statistics using SPSS software as multi-variant statistics and discriminant analysis.

RESULTS AND DISCUSSION

Discriminant analysis for IL-6, IL-4, IL-2, cortisol, beta endorphin, and IgG was to determine strong divergent variables towards immunity caused by breathing exercises (step + breath + concentration) which developed in immune modulation patterns.

Results showed that unity characteristics among respondents after normality test were significant p>0,05, normal and homogeneous (p>0.05). Results of control variables were in normal ranges. After the normality test, it was obtained p>0.05, normal, and after Lavene's test it was obtained p>0.05, homogeneous. Results of dependent variable test with manova was 0,000 of significance that there were differences among the groups (Wilk Lamda, P<0.05). To observe changes on immunity between the intervension group and the control group, on the discriminant analysis, was canonical correlation 0.755. The value of canonical correlation showed high correlation among variables. There was an explanation on the correlation among independent variables and the discriminant function formed by the discriminant

matrix structure. It was found that endorphin (0.501) had the highest correlation to the discriminant function, followed by interleukin-6 (0.367), and other variables had less significant correlation. The discriminator variables which were the magnitude of contribution functions for each discriminator towards immunity modulation were beta endorphin, interleukin-6, and interleukin 4. Thus, beta endorphin had the highest contribution towards the improvement immunity compared to other variables.

Determining the concept of psychoneuro-immunology in the study was expected to determine the relation of physical stresses caused by breathing exercise intervension towards responses of immunity.

Results of manova test on responses of the secretion of IL-6, IL-4, IL-2, cortisol, beta endorphin, and Immunoglobulin on the effect of breathing exercises intervension showed that there was a significant difference ($p<0,05$). The most significant difference was beta endorphin, followed by immunoglobulin and interleukin 6 (Table 1).

Table 1. The statistics on modulation immunity modulation by breathing exercises

Variable	Intervension		Control		
	$\bar{x}$	SD	$\bar{x}$	SD	p
Δ IL6	7,126	13,841	-4,311	14,191	0,034
Δ IL 4	3,049	8,064	2,917	4,533	0,956
Δ IL 2	-2,412	17,418	0,317	13,314	0,633
Δ kort	-4,092	5,280	-2,167	8,437	0,460
Δ β-end	3,907	0,158	3,556	0,416	0,005
Δ IgG	41,804	32,837	-30,888	90,424	0,007

Wilk lamda = 0,350; p = 0,000

Factual results of this study had been reported by Suparto (2001) that breathing exercise could improve physical fitness and body immunity. In terms of relation between breathing exercise and body immunity by physio-biologic exercise-psychoneuroimmunologic behavior through *Limbic Hypothalamus Pituitary Adrenal* (LHPA).

Breathing exercises intervension enhanced levels of beta endorphin, immunoglobulin G and Interleukin 6. However, there were no increasing levels of interleukin 2 and interleukin 4. There was also no significant decrease cortisol level though levels of cortisol in the intervension and the control groups decreased responses.

In relation to immunity caused by stressor of breathing exercise, there were three groups which had high contribution based on the concept of psychoneuroimmunologic. The breathing exercise training was a stimuli on *limbic – hypothalamus – pituitary – adrenal* (LHPA) tract which generated the process of imuno-modulator based on *physio-biology paradigm* from psychoneuroimmunologic.

The Benefits of Breathing Exercises towards Community Health

In line with the development of study results related to breathing exercise stressors, there were results which positively contribute to the increase of participants health. The benefits of breathing exercises conducted by community will be described below.

Study on people suffering from leprosy by Hudijono S, et al. (2008) showed that with active, routine, and proportional exercise, the participants could feel the improvement of their body ability to feel pain and touch sense, cut healing, and relaxing rigid of body part. Furthermore, it reported that after taking pre-basic exercise, asthma patients experienced decreasing frequency of asthma attacks, enhancement body fitness, more relaxing breath, decreasing tired feeling, and lighter asthma attacks.

The above findings demonstrated that breathing exercises could be an alternative sport to enhance physical health of the community. Adianti Handajani et al. In Harmin (2008) state that in HIV/AIDS patients who conducted breathing exercises, having more active cells that produced antibody so that it increased immunity. Based on the review, breathing exercises is cheap, easy to perform, and have relevance benefits to our health whether for preventive, curative, or rehabilitative.

CONCLUSSION

The breathing exercise training of Satria Nusantara in 7 weeks with the frequency of 3 times a week enhanced the levels of beta endorphin, immunoglobulin G, and interleukin 6 while interleukin 2 and interleukin 4 did not improve. The cortisol also did not decrease significantly though the levels reduced. Regular, directed, and programmed breathing exercises had positive effects on the improvement of immunity.

From indicators of immunity modulation based on the concept of psychoneuroimmunologic caused by stressor from breathing exercises, there were 3 divergent variables which were from the highest on beta endorphin, interleukin 6, and interleukin 4. By increasing of the level of beta endorphin, it could be concluded that breathing exercises could provide fresh, fit, and health feeling. On the other hand, steps in breathing exercises could cause muscle skeletal contraction and improvement of the level of interleukin 6. Interleukin 4 would stimulate plasma cells to produce immunoglobulin, including immunoglobulin G.

The stressor of breathing exercise with the combination of steps, breathing manners, and concentration stimulated the *limbic – hypothalamus – pituitary – adrenal* (LHPA) tract which stimulated imunomodulator process based on the phisiobiology paradigm with the concept of psychoneuroimmunologic. Thus, the breathing exercises could be one of the immunomodulators to improve body immunity.

Based on the above explanation, the breathing exercise training could be an alternative inexpensive, easy, but effective sport which could enhanced body immunity.

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